

SECTION 4D: FREQUENCY SHARING BETWEEN NETWORKS OF THE FIXED-SATELLITE
SERVICE – EFFICIENT USE OF THE SPECTRUM
AND GEOSTATIONARY-SATELLITE ORBIT

4D1: Permissible levels of interference

RECOMMENDATION 466-6

**MAXIMUM PERMISSIBLE LEVEL OF INTERFERENCE IN A TELEPHONE CHANNEL
OF A GEOSTATIONARY-SATELLITE NETWORK IN THE FIXED-SATELLITE SERVICE
EMPLOYING FREQUENCY MODULATION WITH FREQUENCY-DIVISION
MULTIPLEX, CAUSED BY OTHER NETWORKS OF THIS SERVICE**

(Question 48/4)

(1970-1974-1978-1982-1986-1990-1992)

The CCIR,

considering

- a) that geostationary satellite networks in the fixed-satellite service operate in the same frequency bands;
- b) that interference between networks in the fixed-satellite service contributes to the noise in the network;
- c) that it is desirable that the interference noise in the telephone channels of networks in the fixed-satellite service caused by transmitters of different networks in that service should be such as to give a reasonable orbit utilization efficiency;
- d) that the overall performance of a network should essentially be under the control of the system designer;
- e) that it is necessary to protect a network in the fixed-satellite service from interference by other such networks;
- f) that it is necessary to specify the maximum permissible interference power in a telephone channel, to determine space station and earth station characteristics;
- g) that the value selected for the maximum permissible single entry of interference noise should not result in too wide a minimum orbital spacing;
- h) that for co-ordination between two satellite networks, it is necessary to know the maximum permissible level of interference in a telephone channel of the wanted network caused by transmitters of the other network;
- j) that networks in the fixed-satellite service may receive interference both into the space station receiver and into the earth station receiver;
- k) that the mean interference noise power should be an appropriate fraction of the total noise power permitted in the hypothetical reference circuit;
- l) that in many cases the largest interference contributions to a geostationary satellite network will be from the networks using geostationary satellites in orbit nearby and serving an overlapping coverage area. The value of interference from any other network will generally be less;
- m) that the accumulation of interference from many entries from other satellite networks and from terrestrial stations is not likely to be equal to the arithmetic sum of the individual interference entries at their maximum value across the band, and the total interference noise level in any single channel may be significantly less;

- n) that the levels of interference between geostationary satellite networks in the fixed-satellite service operating in frequency bands below 10 GHz are not expected to undergo a large variation with time;
- o) that in frequency bands between 10 and 15 GHz where very high propagation attenuation may occur for short periods of time, it would generally be desirable for systems to make use of adaptive up-path power control or earth-station site diversity or other techniques to counteract signal fading and that under these circumstances the levels of interference from other satellite systems would also not undergo a large variation with time;
- p) that the use of syllabic companding may be useful in reducing transmitter power requirements or increasing transmission capacity, but that companded transmissions have a sensitivity to interference which is different from that of uncompanded transmissions
- q) that the level of baseband degradation is inversely proportional to the carrier-to-interference ratio,

recommends

1. that different geostationary-satellite networks in the fixed-satellite service operating in the same frequency bands, below 15 GHz, be designed in such a manner that the interference noise power at a point of zero relative level in any telephone channel of a hypothetical reference circuit of a network in the fixed-satellite service, employing frequency modulation, caused by the aggregate of the earth station and space station transmitters of other fixed satellite networks, should not exceed:

1.1 in frequency bands in which the network does not practise frequency re-use: 2500 pW0p, psophometrically weighted one minute mean power for more than 20% of any month;

1.2 in frequency bands in which the network practises frequency re-use; 2000 pW0p, psophometrically weighted one minute mean power for more than 20% of any month;

2. that the maximum level of the interference noise power at a point of zero relative level in any telephone channel of the hypothetical reference circuit of a geostationary-satellite network in the fixed-satellite service employing frequency modulation, caused by the transmitters of another fixed-satellite network, should not exceed 800 pW0p, psophometrically weighted one minute mean power, for more than 20% of any month;

3. that the maximum level of interference noise power caused to that network should be calculated on the basis of the following values for the receiving earth station antenna gain, in a direction at an angle φ (in degrees) referred to the main beam direction:

$$G = 32 - 25 \log \varphi \quad \text{dBi} \quad \text{for} \quad 1^\circ \leq \varphi < 48^\circ$$

$$G = -10 \quad \text{dBi} \quad \text{for} \quad 48^\circ \leq \varphi \leq 180^\circ$$

except when the actual gain is known and is less than the above value, in which case the actual value should be used;

4. that the following Notes should be regarded as part of this Recommendation:

Note 1 — The values quoted in § 1.1, 1.2 and 2 are not intended to apply:

- a) to networks for which a complete advance publication was submitted to the IFRB by the time of the CCIR XIVth Plenary Assembly, 1978; for such networks the aggregate interference power in any telephone channel should not exceed 1 000 pW0p psophometrically weighted one minute mean power for more than 20% of any month, and the single-entry interference noise power should not exceed 400 pW0p, psophometrically weighted one minute mean power, for more than 20% of any month;